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AIGC-driven transformation of international Chinese language education in Kyrgyzstan

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Abstract. This study investigated the integration of Artificial Intelligence Generated Content technologies with Second Language Acquisition principles to enhance personalised Chinese language learning for non-native speakers, focusing on Kyrgyzstan within the Belt and Road Initiative framework. The research employed a mixed-methods approach, combining comprehensive evaluations of three platforms (ChatGPT, DeepSeek, and Doubao), semi-structured interviews with educational experts, and theoretical analysis grounded in established theories including Krashen's Input Hypothesis and Long's Interaction Hypothesis. Platform assessments demonstrated varying capabilities across critical dimensions, with DeepSeek showing superior language processing performance. Expert interviews identified three primary mechanisms for personalised learning: adaptive content generation, individualised progress tracking, and immediate feedback delivery. However, cultural adaptability emerges as a significant challenge, revealing limitations in addressing sociocultural learning contexts that require human pedagogical expertise. The study developed a strategic four-phase implementation framework addressing key barriers including technical infrastructure constraints, teacher preparedness gaps, and economic limitations. Cultural bridging strategies were proposed to connect Chinese language content with local contexts, providing replicable models for diverse Belt and Road Initiative regions. The research demonstrated Artificial Intelligence Generated Content's potential to augment rather than replace human instruction through intelligent content creation and adaptive learning pathways. While acknowledging methodological limitations including sample size constraints and absence of direct learner outcome measurements, the findings established a foundation for sustainable, culturally responsive technology integration in international Chinese language education

Keywords: language learning theories; AIGC technology; Chinese instruction; educational model reform; technology in pedagogy

INTRODUCTION

The accelerating pace of globalisation and China's expanding international influence, particularly through the Belt and Road Initiative (BRI), positioned international Chinese language education at a critical juncture, marked by unprecedented opportunities and significant challenges. The global demand for Chinese language proficiency surged, driven by academic, professional, and cultural aspirations. This trend was particularly pronounced in BRI partner countries such as Kyrgyzstan, where economic ties and cultural exchanges with China deepened. L. Xie & M. Gunaban (2024) identified resource shortages as a primary barrier to Chinese language instruction in Central Asia, providing a contextual foundation for examining technology-driven solutions in the present investigation. Similarly, C. Wang *et al.* (2024) underscored the necessity for advanced language skills in cross-cultural communication within BRI economic frameworks, highlighting the urgency for innovative pedagogical approaches tailored to these regions. Conventional pedagogical models often struggled to accommodate learner diversity, provide personalised instruction, or address region-specific needs, such as limited access to qualified teachers and culturally relevant materials in Central Asia. Y. Lai (2024) demonstrated that traditional approaches frequently failed to adapt to the

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distinct linguistic backgrounds of learners in non-native contexts, resulting in inefficiencies in language acquisition. This challenge was compounded in resource-constrained environments like Kyrgyzstan, where infrastructure limitations further restricted access to quality education, as S. Zhypar (2024) pointed out in an analysis of local educational barriers. These gaps accentuated the pressing need for adaptive and scalable solutions to enhance global Chinese language education.

Artificial Intelligence Generated Content (AIGC) technology emerged as a promising avenue for educational reform by enabling personalised learning resources, real-time feedback, and immersive learning environments. L. Chen *et al.* (2020) established that AIGC tools addressed pedagogical challenges in contexts with limited resources by automating content creation and feedback mechanisms, a finding that shaped the evaluation framework for this study. This potential was particularly relevant for Chinese language instruction, given its unique features such as tonal phonology and logographic script, which posed significant difficulties for learners with dissimilar native languages, as Y. Aini *et al.* (2025) illustrated through their examination of learner challenges in non-tonal linguistic backgrounds. However, despite growing interest in AIGC applications, research integrating these technologies with Second Language Acquisition (SLA) theory in the context of international Chinese education, especially within BRI regions, remained scarce. F. Song *et al.* (2023) argued that this research gap was critical, as the complex linguistic and cultural landscape of Chinese language learning in Central Asia demanded specialised instructional approaches, a perspective that directly informed the focus of this investigation. Additionally, W. Holmes & I. Tuomi (2022) provided evidence on the broader transformative potential of AI in education, cautioning against ethical risks such as data privacy, which further guided the ethical considerations in this study.

The aim of this study was to address the identified gap by investigating how AIGC technologies could be aligned with SLA principles to enhance Chinese language acquisition, innovate teaching practices, and overcome the unique challenges faced in international Chinese language education, with a particular focus on Kyrgyzstan as a representative BRI context. Through this exploration, the study sought to contribute to both theoretical understanding and practical implementation of AIGC in diverse educational settings.

LITERATURE REVIEW

The integration of artificial intelligence (AI) in language education emerged as a pivotal area of research, reflecting the global shift towards digitalisation in learning environments. AIGC and related technologies gained recognition for their transformative potential in enhancing language instruction, particularly in underrepresented regions such as Central Asia within the BRI framework. This section reviews existing literature across key themes: AI applications in language education, alignment with SLA theory, and specific challenges in international Chinese language education. A substantial body of research highlighted the capacity of AI to personalise instruction and streamline learning processes. E. Kasneci *et al.* (2023) provided evidence on the personalisation potential of large language models (LLMs), demonstrating their ability to tailor content to individual learner needs and adapt learning pathways. However, their caution against algorithmic bias and privacy concerns informed the ethical evaluation criteria adopted in the platform assessments conducted for this study. L. Chen *et al.* (2020) further illustrated that AI applications targeting pronunciation and vocabulary acquisition improved learning efficiency through immediate feedback, though R. Godwin-Jones (2022) countered that such tools often neglected pragmatic competence and cultural fluency, a limitation that guided the emphasis on holistic learning outcomes in this research. Ethical challenges, including data security and linguistic bias, remained underexplored, as F. Aljabr & A. Al-Ahdal (2024) noted, prompting the inclusion of ethical considerations in the study design.

SLA theory remained a cornerstone for language teaching methodologies, though its practical application faced constraints. While foundational works by H. Brown (2007) and R. Ellis (2015) documented key frameworks like Krashen's Input Hypothesis, P. Lightbown & N. Spada (2021) observed that limited resources and teacher expertise often hindered implementation in non-traditional environments, a challenge central to this study's context in Kyrgyzstan. AIGC offered opportunities to bridge this gap, as A. Betal (2023) suggested that AI platforms simulated natural language input and interaction, aligning with SLA principles. J. Tu (2020) further argued that AIGC tools operationalised theoretical concepts by providing comprehensible input, though their learner-specific alignment required validation, a gap that this research aimed to address through empirical testing. F. Song *et al.* (2023) added that consistency between AI-generated content and SLA concepts like affective factors was rarely evaluated in specific language contexts, influencing the theoretical framework developed for this investigation.

Research on AIGC applications in international Chinese language education revealed significant gaps. Y. Aini *et al.* (2025) noted that most studies focused on general or English-oriented frameworks, overlooking the unique linguistic features of Chinese, such as tonal phonology, a finding that shaped the focus on language-specific challenges in this study. S. Jiang & J. He (2025) highlighted that learners with dissimilar native languages faced distinct barriers, often ignored in AI research, prompting an emphasis on cross-linguistic issues in the BRI context. X. Liu-Schuppener (2023) and W. Zhang & H. Dou (2025) explored AIGC in Chinese vocational education, yet broader pedagogical issues in international settings remained underexamined, as B. Xu (2024) pointed out for resource-constrained BRI regions.

Y. Xie *et al.* (2019) suggested that immersive technologies like Virtual Reality held promise for cultural learning, though practical application in Chinese education remained limited, shaping the call for innovative solutions

here. Teacher training for AIGC integration represented another challenge, as X. Tan *et al.* (2025) identified a lack of digital literacy among educators, a barrier considered in the implementation strategies proposed. C. Zhang (2024) and S. Yu *et al.* (2025) further highlighted scalability and accessibility issues in resource-limited environments, aligning with G. Stockwell (2012) and J. Richards & T. Rodgers (2014) on the need to balance technological innovation with pedagogical goals, a principle central to the practical focus of this investigation. In summary, while AI and AIGC presented significant opportunities for language education, systematic research on their integration into international Chinese language education from an SLA perspective remained insufficient. The linguistic and cultural complexities of Chinese, alongside practical challenges in BRI contexts, necessitated targeted exploration, which this study aimed to provide through a focus on Kyrgyzstan as a representative case.

MATERIALS AND METHODS

This study employed a mixed-method approach to evaluate the integration of AIGC technologies into international Chinese language education, focusing on Kyrgyzstan within the BRI context. The methodology encompassed three key components: a systematic literature review, semi-structured expert interviews, and platform performance evaluations. A systematic review of academic publications was conducted to establish a theoretical foundation. Databases such as CNKI, Web of Science, and Google Scholar were searched using terms like AIGC, artificial intelligence, Chinese language education, and Belt and Road Initiative. Over 150 articles were screened, prioritising studies on AI applications in language learning and Central Asian educational contexts. Selected 33 studies were analysed to extract insights on SLA principles and technology integration in pedagogy.

Semi-structured interviews were conducted with eight experts in Chinese language teaching and educational technology between December 2024 and May 2025. The purposively selected sample was designed to ensure comprehensive coverage of relevant expertise areas and geographical contexts within the BRI framework. Expert selection criteria included: (1) minimum five years of experience in Chinese language education or educational technology; (2) demonstrated expertise in Central Asian educational contexts or cross-cultural language instruction; and (3) current involvement in international Chinese language education programmes. The expert panel comprised four university lecturers experienced in Central Asia (Experts A, B, C, and D), two educational technology specialists (Experts E and F), and two practitioners teaching Chinese to Turkic learners (Experts G and H). Interviews were conducted through both face-to-face meetings and online sessions via Zoom, with each 60-minute interview being audio-recorded following explicit participant consent. Ethical standards were upheld through informed consent procedures, participant anonymity protection, and secure data storage protocols per institutional guidelines (American Sociological Association's Code of Ethics, 2018). The interview protocol consisted of three main sections: (1) assessment of AIGC potential for personalised Chinese language instruction; (2) evaluation of cultural adaptation challenges specific to Kyrgyzstan and Central Asian contexts; and (3) identification of implementation barriers and strategic solutions. Questions were pilot-tested with two additional experts not included in the final sample to ensure clarity and comprehensiveness.

All interview responses were transcribed verbatim and imported into NVivo 12 software for systematic thematic analysis. The coding process followed a hybrid approach, combining deductive codes derived from Second Language Acquisition theory and inductive codes emerging from the data. To ensure reliability, data coding involved three independent researchers who achieved an inter-rater reliability coefficient of 0.89 using Cohen's kappa. Discrepancies were resolved through discussion and consensus, enhancing the consistency and validity of identified themes. The final coding scheme encompassed 12 primary themes and 34 sub-themes, providing a comprehensive framework for understanding expert perspectives on AIGC integration in international Chinese language education.

The suitability of AIGC platforms for Chinese language education was assessed using ChatGPT (OpenAI, GPT-4.1 model), DeepSeek (DeepSeek-V3), and Doubao (ByteDance, Doubao-Large model) between December 2024 and May 2025. Evaluation criteria, aligned with SLA principles and Kyrgyz learner needs, included five dimensions: language processing accuracy (e.g., tone and character recognition), cultural adaptability to Central Asian contexts, personalised learning support, feedback quality, and user interface usability. Platforms were tested through simulated teaching scenarios, scored on a 5-point scale per criterion, and triangulated with expert feedback for validity. The assessment focused on platform capabilities as evaluated by the research team, without direct learner involvement. Artificial intelligence tools were employed solely as supportive instruments during the research process. The full responsibility for the conceptualisation, analysis, and conclusions presented in this article rests entirely with the author.

RESULTS

AIGC platform performance capabilities for enhanced Chinese language instruction

The comprehensive evaluation of ChatGPT, DeepSeek, and Doubao revealed distinct pedagogical strengths that address specific challenges in Chinese language instruction within resource-constrained environments like Kyrgyzstan. Each platform demonstrated unique capabilities that align with different aspects of language learning theory and practical classroom needs, providing educators with complementary tools for enhanced instruction. The comparative analysis of platform performance across five critical dimensions demonstrates significant variations in capabilities, with overall scores ranging from 3.8 to 3.9 out of 5.0, indicating generally strong but differentiated performance

profiles (Table 1). These findings, compiled from expert evaluations and systematic platform testing conducted between December 2024 and May 2025, achieved high reliability coefficients ranging from 0.87 to 0.94 across evaluation dimensions, confirming the robustness of the assessment framework.

Table 1. *Comprehensive AIGC platform performance evaluation*

Platform	Language processing	Cultural adaptability	Personalised learning	Feedback quality	User interface	Overall score
ChatGPT	4.2/5.0	3.4/5.0	3.8/5.0	3.2/5.0	4.3/5.0	3.8/5.0
DeepSeek	4.6/5.0	3.1/5.0	4.2/5.0	4.1/5.0	3.3/5.0	3.9/5.0
Doubao	4.1/5.0	3.6/5.0	4.4/5.0	3.5/5.0	3.9/5.0	3.9/5.0

Source*: compiled by the author*

ChatGPT demonstrated exceptional performance in conversational content generation and user accessibility, achieving notable scores of 4.2/5.0 for language processing accuracy and 4.3/5.0 for user interface usability. The platform's strength lies in its ability to generate diverse, contextually appropriate dialogue materials at scale. Testing revealed its capacity to produce hundreds of unique conversation scenarios within minutes, covering topics from basic daily interactions to complex business negotiations relevant to BRI contexts. The platform's multilingual support and intuitive interface design make it particularly accessible to educators with varying levels of technological expertise, a crucial factor for adoption in multilingual educational environments like Kyrgyzstan. However, ChatGPT's limitations became apparent in systematic error detection and cultural adaptation. The platform scored 3.2/5.0 for feedback quality, indicating challenges in providing targeted corrective guidance that addresses specific learner needs. Its cultural adaptability score of 3.4/5.0 reflects difficulties in generating content that resonates with Central Asian cultural contexts, often defaulting to Han Chinese cultural references that may lack relevance for Kyrgyz learners.

DeepSeek distinguished itself through superior Chinese language processing capabilities, achieving the highest scores in language accuracy (4.6/5.0) and feedback quality (4.1/5.0). The platform's training on extensive Chinese corpora enables remarkably precise character recognition, grammatical analysis, and error detection. Systematic testing revealed its exceptional ability to identify cross-linguistic interference patterns, particularly those characteristic of Kyrgyz-Chinese language pairs, such as Subject-Object-Verb (SOV) word order transfer and tonal discrimination challenges. The platform's personalised learning support capabilities, scoring 4.2/5.0, demonstrated sophisticated content adaptation mechanisms that automatically adjust vocabulary density, sentence complexity, and grammatical structures based on learner performance indicators. This adaptive functionality represents a significant advancement over static educational materials, providing dynamic content that responds to individual learning trajectories. However, DeepSeek's user interface scored lower (3.3/5.0), reflecting a more technical design that may present accessibility challenges for less technologically proficient educators.

Doubao excelled in multimodal content integration and learner engagement, achieving the highest score for personalised learning support (4.4/5.0) and the strongest performance in cultural adaptability (3.6/5.0). The platform's ability to coordinate text, audio, and visual elements creates immersive learning experiences that address diverse learning styles simultaneously. Its multimodal approach proves particularly effective for Chinese character acquisition, where visual-spatial processing remains crucial for learner success. Testing revealed Doubao's superior capability in generating culturally diverse content scenarios compared to other platforms, incorporating references to Central Asian contexts and BRI-related situations more naturally. This cultural sensitivity, while still limited, represents meaningful progress toward more inclusive content generation that acknowledges learners' diverse backgrounds and motivations for Chinese language study. The triangulation process revealed strong correlation between quantitative scores and qualitative assessments, with reliability coefficients ranging from 0.87 to 0.94 across different dimensions, confirming the accuracy of the evaluation framework and providing confidence in the comparative analysis.

Expert perspectives on personalised learning facilitation and implementation barriers

Building upon the platform performance evaluation, expert analysis provided crucial insights into how AIGC capabilities translate into practical educational benefits and the challenges that must be overcome for successful implementation. The systematic thematic analysis of semi-structured interviews with eight carefully selected experts revealed remarkable consistency in perspectives, demonstrating the robustness of findings across diverse expertise areas and geographical contexts within the BRI framework. The comprehensive analysis using NVivo 12 software identified 12 primary themes emerging from 103 coded segments across all interviews, with inter-rater reliability achieving Cohen's $\kappa = 0.89$, confirming the validity of identified themes. The analysis revealed three overarching meta-themes: Technological Affordances (encompassing platform capabilities

and technical barriers), Pedagogical Transformation (including personalised learning and cultural adaptation), and Implementation Ecology (covering institutional barriers and scalability considerations). These findings directly address the research objectives by providing expert validation of platform capabilities while identifying critical implementation considerations for Central Asian educational contexts (Table 2).

Table 2. *Expert interview thematic analysis results*

Primary theme	Sub-themes	Expert frequency	Coded segments	Representative quote
Personalised learning mechanisms	4	8/8 (100%)	24	"AIGC platforms demonstrate remarkable ability to adjust content complexity..." (Expert D)
Technical infrastructure barriers	2	8/8 (100%)	18	"Inconsistent connectivity remains the primary obstacle..." (Expert F)
Cultural adaptation challenges	3	7/8 (87.5%)	15	"Platforms struggle with deeper cultural personalisation..." (Expert G)
Platform-specific capabilities	4	8/8 (100%)	14	"DeepSeek excels at error pattern recognition..." (Expert B)
Implementation strategies	3	7/8 (87.5%)	12	"Hybrid models leverage technological strengths..." (Expert E)
Teacher preparedness issues	3	6/8 (75%)	10	"Technology anxiety impacts adoption rates..." (Expert C)
Economic constraints	2	5/8 (62.5%)	10	"Budget limitations require phased approaches..." (Expert A)

Source: *compiled by the author*

When directly addressing the research question "How can AIGC tools facilitate personalised learning for non-native Chinese learners?", expert responses revealed three primary mechanisms that align closely with the quantitative platform evaluation findings. The most prominent theme, mentioned by all eight experts across 24 coded segments, centred on adaptive content generation capabilities. Expert D provided comprehensive analysis connecting platform evaluation findings: "AIGC platforms demonstrate remarkable ability to adjust content complexity, vocabulary frequency, and grammatical structures based on learner performance data. DeepSeek's high scores in language processing and personalised learning reflect sophisticated adaptation algorithms, while Doubao's multimodal capabilities create multiple pathways for content personalisation."

The second major theme, individual progress tracking and adaptive pathways, emerged in 18 coded segments across six experts, directly validating the personalised learning dimension assessed in the platform evaluation. Expert F explained how this addresses regional challenges: "AIGC platforms excel at continuous assessment and pathway modification, providing learners with immediate feedback and redirecting study focus based on performance patterns. This capability proves particularly valuable in Kyrgyzstan where teacher-student ratios often exceed optimal levels for individual attention." DeepSeek's superior feedback quality performance (4.1/5.0) enables sophisticated error pattern recognition, as Expert A detailed: "When Kyrgyz students consistently produce SOV word order in Chinese sentences, DeepSeek recognises this as L1 interference rather than random error, providing targeted explanations and practice exercises."

The third theme, immediate feedback and corrective guidance, was universally mentioned by all experts across 16 coded segments, corroborating the feedback quality assessments in the platform evaluation. Expert B emphasised how this addresses persistent challenges: "The immediate feedback capability tackles one of the most difficult aspects of Chinese language instruction, providing timely, accurate correction of learner errors. Traditional classroom settings often cannot accommodate the intensive feedback requirements of Chinese language learning, particularly for tonal and character production."

However, expert analysis also revealed significant limitations that complement and validate the quantitative findings. The moderate cultural adaptability scores across all platforms (3.1 to 3.6/5.0) reflect deeper challenges consistently identified across 15 coded segments. Expert G noted: "While AIGC platforms excel at surface-level personalisation, they struggle with deeper cultural and motivational personalisation that accounts for learners' cultural backgrounds and learning goals." This expert insight directly explains the relatively lower cultural adaptability scores observed in the platform evaluation, providing crucial context for understanding these quantitative results. The expert consultation process also addressed implementation barriers and strategic solutions, fulfilling the research objective of identifying practical deployment strategies for resource-constrained environments. The systematic analysis revealed four primary barrier categories that must be addressed for successful AIGC integration in Central Asian educational contexts (Table 3).

Table 3. *Expert-identified implementation barriers and strategic solutions*

Barrier category	Specific challenges	Expert-recommended solutions	Implementation considerations
Technical infrastructure	Inconsistent connectivity, hardware limitations	Hybrid offline/online models, phased upgrades	Requires institutional planning
Cultural-linguistic adaptation	Limited cultural sensitivity, L1 interference gaps	Cultural bridging protocols, teacher mediation	Demands pedagogical expertise
Teacher preparedness	Technology anxiety, integration skills gaps	Enhancement-focused training, collaborative models	Needs comprehensive support
Economic constraints	Budget limitations, implementation costs	Phased adoption, cost-sharing strategies	Requires long-term planning

Source: *compiled by the author*

These expert findings demonstrate strong correspondence with the methodological framework established for this study. The purposive sampling of eight experts across diverse expertise areas (university lecturers experienced in Central Asia, educational technology specialists, and practitioners teaching Chinese to Turkic learners) ensured comprehensive coverage of relevant perspectives, while the systematic thematic analysis using NVivo 12 provided rigorous analytical validation. The high inter-rater reliability (Cohen's $\kappa = 0.89$) achieved through independent coding by three researchers confirms the robustness of identified themes and their alignment with the research objectives of evaluating AIGC potential and identifying implementation strategies for Central Asian contexts.

Theoretical alignment between AIGC capabilities and second language acquisition principles

The convergence of platform performance data and expert insights establishes a foundation for examining how AIGC technologies align with established Second Language Acquisition theoretical frameworks. This theoretical analysis reveals why certain platform capabilities prove effective while illuminating the pedagogical principles that must guide successful AIGC integration in Chinese language education. The adaptive content generation capabilities that experts universally identified as AIGC's primary strength find substantial theoretical support in Krashen's Input Hypothesis, which emphasises providing comprehensible input at the "i + 1" level, slightly beyond the learner's current proficiency. DeepSeek's sophisticated adaptation mechanisms, evidenced by its high personalised learning score (4.2/5.0) and validated through expert testimony, exemplify this theoretical alignment. Expert C's observation that "DeepSeek analyses learner performance metrics to modify vocabulary density and sentence complexity automatically, ensuring materials challenge learners without overwhelming them" directly operationalises Krashen's framework through automated calibration of input difficulty.

This technological implementation represents a significant advancement over static materials, providing dynamic adjustment that mirrors expert teacher intuition in maintaining optimal challenge levels. The platform's ability to recognise when intermediate Kyrgyz learners struggle with complex syntax and respond by reducing structural complexity while gradually introducing new lexical items demonstrates sophisticated implementation of the "i + 1" principle. However, Expert D's caution reveals important limitations: "while platforms excel at adjusting linguistic complexity based on performance data, they often fail to account for affective factors that influence input comprehensibility," highlighting the gap between technological capability and Krashen's Affective Filter Hypothesis.

Long's Interaction Hypothesis, emphasising meaningful interaction and corrective feedback in language acquisition, receives substantial validation through AIGC feedback mechanisms, particularly those demonstrated by DeepSeek's superior feedback quality score (4.1/5.0). Expert A's detailed example illustrates this alignment: "DeepSeek recognises SOV word order patterns as systematic L1 interference rather than random error, providing targeted explanations and practice exercises." This capability extends beyond simple correction to encompass the negotiation of meaning that Long identifies as central to acquisition, though Expert B identifies a crucial limitation: "while platforms provide feedback, they struggle to engage in meaningful negotiation that characterises effective human interaction."

Vygotsky's sociocultural theory, particularly the concept of the Zone of Proximal Development (ZPD), finds mixed support in current AIGC implementations. Doubao's multimodal capabilities, reflected in its highest personalised learning score (4.4/5.0), demonstrate potential for scaffolded learning that aligns with Vygotskian principles. Expert H observed that "Doubao's ability to provide coordinated visual, auditory, and textual support creates multiple pathways for learner understanding, potentially expanding the ZPD through varied representational modes." However, Expert G identified a fundamental limitation: "The collaborative construction of knowledge through social interaction, central to sociocultural theory, cannot be adequately replicated through current AI systems, regardless of their technical sophistication."

Strategic implementation framework and practical application scenarios

The synthesis of platform capabilities, expert insights, and theoretical understanding enables the development of comprehensive implementation strategies that translate AIGC

potential into sustainable educational practice. This multi-tiered strategic framework addresses both technological possibilities and contextual constraints in resource-limited environments like Kyrgyzstan, directly responding to expert-identified themes of economic constraints (mentioned by 5/8 experts) and teacher preparedness issues (identified by 6/8 experts) while leveraging complementary platform strengths. The strategic framework encompasses four interconnected implementation phases, each designed to build institutional capacity while demonstrating educational value through progressive complexity and sophistication. This phased approach addresses the expert consensus on the need for gradual technology integration while maximising the distinct capabilities of each platform within appropriate pedagogical contexts.

Phase 1 establishes foundational capabilities through low-risk, high-impact applications that capitalise on ChatGPT's accessibility strengths, evidenced by its superior user interface score (4.3/5.0) while requiring minimal infrastructure investment. Expert C's recommendation to "begin with free platform features for basic content generation" exemplifies this approach, allowing institutions to experience AIGC capabilities without financial commitment while building teacher confidence and technical familiarity.

Phase 2 introduces sophisticated multimodal integration through Doubao's advanced capabilities, leveraging its highest personalised learning score (4.4/5.0) to address specific linguistic challenges identified in the cultural adaptation analysis. Expert A's practical scenario demonstrates implementation: "In intermediate phonetics classes, teachers use Doubao to generate animated pitch contours synchronised with audio examples, directly targeting the tonal discrimination difficulties that Kyrgyz speakers face." This phase addresses the technical infrastructure barriers identified by all experts while providing tangible learning improvements.

Phase 3 incorporates DeepSeek's advanced analytical capabilities, utilising its superior language processing (4.6/5.0) and feedback quality (4.1/5.0) scores to address systematic grammatical challenges characteristic of Kyrgyz-Chinese language transfer. Expert E's university-level implementation exemplifies this approach: "In advanced writing classes, teachers use DeepSeek to analyse student compositions and identify patterns of SOV word order transfer from Kyrgyz to Chinese, generating targeted exercises while teachers facilitate peer discussions." This phase directly addresses the personalised learning mechanisms theme identified across all expert interviews.

Phase 4 achieves comprehensive integration by combining multiple platform capabilities within coherent pedagogical frameworks, addressing the implementation strategies theme identified across 7/8 expert interviews. This phase represents the culmination of institutional capacity building, enabling sophisticated coordination of technological capabilities with established pedagogical practices. Cultural adaptation emerges as a critical success factor requiring systematic attention across all implementation phases. The moderate cultural adaptability scores across all platforms (3.1 to 3.6/5.0) necessitate innovative approaches that bridge technological capabilities with local cultural contexts. Expert G's comprehensive strategy provides a practical model: "Teachers use AIGC-generated content about Chinese festivals as starting points, then facilitate discussions connecting these concepts to Kyrgyz cultural equivalents, creating meaningful cultural bridges that enhance both linguistic and cultural competence." The implementation framework synthesises these insights into a structured approach that addresses both technological capabilities and contextual constraints, providing institutions with clear progression pathways while maintaining pedagogical effectiveness (Table 4).

Table 4. *Strategic implementation framework for AIGC integration*

Implementation phase	Primary focus	Platform applications	Infrastructure requirements	Success indicators
Phase 1: Foundation	Low-risk demonstration	ChatGPT dialogue generation	Basic internet access	Teacher confidence, engagement
Phase 2: Enhancement	Multimodal integration	Doubao pronunciation training	Stable connectivity, audio tools	Improved pronunciation accuracy
Phase 3: Sophistication	Error analysis integration	DeepSeek grammar correction	Advanced hardware, training	Reduced systematic errors
Phase 4: Comprehensive	Integrated platform use	Multi-platform coordination	Full infrastructure, support	Holistic language improvement

Source: *compiled by the author*

This strategic framework provides institutions with evidence-based implementation pathways that acknowledge both technological potential and practical constraints, ensuring sustainable integration of AIGC technologies within existing educational structures while maximising pedagogical effectiveness for Chinese language instruction in Central Asian contexts.

DISCUSSION

The results of this study demonstrate that AIGC platforms provide measurable improvements in personalised instruction, immediate feedback, and adaptive learning in Kyrgyz educational contexts. These findings resonate with earlier research, while also advancing understanding of platform-specific strengths and limitations. For instance,

the evaluation of real-time corrective feedback mirrors the paper by P. Ramana *et al.* (2024) – study of AI-driven chatbots in English learning, which highlighted enhanced engagement but also revealed difficulties in cultural contextualisation. In the Kyrgyz setting, these limitations were echoed by expert testimonies emphasising the need for teacher mediation in cultural adaptation. Similarly, the superior analytical precision of DeepSeek, especially in identifying L1 interference patterns, corresponds with C. Chen & Y. Gong's (2025) findings that AI-assisted writing tools are particularly effective at recognising systematic learner errors.

The immersive, multimodal affordances observed in Doubao parallel M. Arif *et al.* (2025), who reported that AI-driven tools in Chinese instruction improved phonological accuracy among international students. This convergence suggests that multimodal integration is especially beneficial for complex languages like Chinese, where tonal and script-based features present persistent challenges. At the same time, the results of the present study showed that Doubao's greater cultural adaptability, compared with other platforms, partially addresses the deficiencies noted by J. Xia *et al.* (2024), who found that most AIGC applications neglect cultural fluency. Moreover, the strong performance of ChatGPT in generating contextually appropriate dialogues aligns with E. Bonner *et al.* (2023), who demonstrated that LLMs can provide scalable teaching materials in under-resourced environments. However, while E. Bonner *et al.* emphasised the broad utility of AI content, findings of the present research indicate that ChatGPT's limited capacity for deep cultural personalisation remains a significant barrier in Kyrgyzstan.

The expert interviews confirmed these comparative insights by highlighting the importance of hybrid approaches. As X. Tan *et al.* (2025) observed, teacher preparedness and professional development are indispensable for sustainable AIGC adoption. The data of the present research suggest that AIGC technologies, while highly effective in automating adaptive input and feedback, cannot yet replace human mediation in the sociocultural dimensions of learning. This supports the conclusions of B. Li *et al.* (2025), who argued that learner affective factors, such as anxiety and motivation, require more comprehensive evaluation in AI-assisted contexts. This is further reinforced by the findings of V. Riznyk & N. Riznyk (2024), who proposed a pedagogical system for vocational education that integrates a range of AI tools, highlighting the importance of a structured, methodological approach to AI implementation in education. Taken together, these comparisons reveal that while AIGC platforms offer meaningful pedagogical advantages for Chinese language instruction, their effectiveness depends on strategic integration with human expertise and culturally responsive teaching. By situating the findings of the present research within prior research, it becomes clear that AIGC should be regarded not as a substitute for teachers but as a complementary tool that enhances language learning when guided by robust pedagogical frameworks.

CONCLUSIONS

This study fills a vital gap in international Chinese language education by exploring the integration of AIGC technologies with SLA principles to advance personalised learning for non-native learners, with a specific focus on Kyrgyzstan within the BRI framework. Through comprehensive platform evaluations, interviews with eight expert specialists, and in-depth theoretical analysis, the research delivers empirical evidence and practical frameworks for sustainable AIGC implementation in resource-constrained educational environments. The findings underscore AIGC's significant potential for personalised Chinese language instruction, as evidenced by platform performance scores ranging from 3.8/5.0 to 3.9/5.0 across critical dimensions. Three primary mechanisms stand out: adaptive content generation (supported by all experts), individual progress tracking with tailored learning pathways (endorsed by 75% of experts), and immediate feedback delivery (unanimously highlighted by experts). These mechanisms align closely with SLA theories, reinforcing Krashen's Input Hypothesis through customised "i + 1" content adjustments and Long's Interaction Hypothesis via sophisticated error detection, exemplified by DeepSeek's top language processing score of 4.6/5.0. However, cultural adaptability remains a notable challenge, with scores ranging from 3.1/5.0 to 3.6/5.0, revealing AIGC's limitations in addressing Vygotsky's sociocultural aspects such as collaborative learning, which still demand human pedagogical expertise. From a practical perspective, the study formulates a four-phase strategic implementation framework customised for BRI contexts like Kyrgyzstan, addressing key barriers noted by experts: technical infrastructure limitations (identified by all experts), gaps in teacher preparedness (noted by 75%), and economic constraints (mentioned by 62.5%). This framework evolves from low-risk applications leveraging ChatGPT's user-friendly interface (4.3/5.0 usability score) to full-scale multi-platform integration, incorporating DeepSeek for grammatical analysis and Doubao for multimodal learning support (4.4/5.0 personalised learning score). Furthermore, cultural bridging strategies that link Chinese content to Kyrgyz cultural contexts offer replicable models to enhance cross-cultural learning effectiveness across diverse BRI regions.

The research highlights that AIGC's true transformative potential lies in augmenting, rather than replacing, human instruction through intelligent content creation and adaptive learning pathways. This perspective informs critical implications for teacher training and institutional strategies, emphasising enhancement over substitution in technology adoption. However, the study acknowledges significant shortcomings that must be addressed. A primary limitation is the absence of direct measurement of learner outcomes, which restricts the ability to validate the real-world impact of AIGC on language acquisition.

Additionally, the small sample size of only eight experts limits the generalisability of the findings, potentially overlooking diverse perspectives. Furthermore, persistent cultural adaptation challenges highlight a critical gap, as AIGC struggles to fully incorporate sociocultural dimensions of learning, necessitating ongoing human mediation to bridge cultural contexts effectively. Future research should prioritise longitudinal studies on learner outcomes through controlled implementations of the proposed framework in Kyrgyz institutions, focusing on learner autonomy, cultural competence, and long-term retention. Developing culturally adaptive AI algorithms tailored to Central Asian contexts and fostering collaboration among technology developers, SLA theorists, and regional educators will ensure a balance between innovation and pedagogical as well as cultural relevance. Moreover, addressing these identified deficiencies is crucial, particularly by expanding research scope to include larger and more diverse expert samples and direct learner data. Attention to ethical concerns such as data privacy and algorithmic bias is also essential to guarantee equitable educational applications and mitigate potential risks associated with AIGC deployment.

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CONFLICT OF INTEREST

None.

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AIGC тарабынан башкарылган Кыргызстандагы эл аралык кытай тили билиминин трансформациясы

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Аннотация. Бул изилдөөдө жасалма интеллект тарабынан түзүлгөн контент (AIGC) технологияларын экинчи тилди өздөштүрүү (SLA) принциптери менен интеграциялоо каралып, кытай тилин чет тил катары үйрөнгөндөр үчүн жекелештирилген окутууну жакшыртуу максаты коюлган. Изилдөө “Бир алкак – бир жол” демилгеси алкагында Кыргызстанга багытталган. Иш аралаш методдорго негизделип, үч платформанын (ChatGPT, DeepSeek жана Doubao) комплекстүү баалоосун, билим берүү адистери менен жарым структураланган маектерди жана белгилүү теорияларга (Крашендин киргизүү гипотезасы, Лондун өз ара аракеттенүү гипотезасы) таянган теориялык талдоону камтыды. Платформаларды баалоо алардын мүмкүнчүлүктөрү боюнча айырмачылыктарды көрсөттү, DeepSeek тилди иштетүү боюнча эң жогорку көрсөткүчтөрдү берди. Эксперттик маектер жекелештирилген окутуунун үч негизги механизмин аныктады: адаптивдүү контент түзүү, жеке прогрессти көзөмөлдөө жана дароо пикир кайтаруу. Бирок маданий адаптация олуттуу чакырык бойдон калууда, анткени ал социалдык-маданий контекстти толук эске алууда чектөөлөрдү ачып берди жана педагогикалык адистердин катышуусун талап кылат. Изилдөөдө техникалык инфраструктуранын жетишсиздиги, мугалимдердин даярдыктагы боштуктары жана экономикалык чектөөлөр сыяктуу негизги тоскоолдуктарды чечүүгө багытталган төрт фазалуу стратегиялык модель иштелип чыкты. Кытай тилинин окуу контентин жергиликтүү контексттер менен байланыштырган маданий көпүрө стратегиялары сунушталып, алар “Бир алкак – бир жол” демилгесинин ар түрдүү аймактары үчүн үлгү боло алат. Изилдөө AIGC технологиялары мугалимдерди алмаштырбай, тескерисинче, алардын ишин толуктай алаарын көрсөттү – интеллектуалдык контент жаратуу жана адаптивдүү окуу жолдору аркылуу. Методологиялык чектөөлөрдү (мисалы, үлгүнүн чакан көлөмү жана түздөн-түз окуучулардын жыйынтыктарынын жоктугу) эске алуу менен, алынган жыйынтыктар эл аралык кытай тили окутуусунда технологияларды туруктуу жана маданий жактан ылайык интеграциялоонун негизин түздү

Негизги сөздөр: тил үйрөнүү теориялары; AIGC технологиясы; кытай тилин окутуу; билим берүү моделин реформалоо; педагогикадагы технология

Трансформация международного образования по китайскому языку в Кыргызстане под влиянием AIGC

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Аннотация. В данном исследовании рассматривалась интеграция технологий искусственного интеллекта, генерирующего контент (AIGC), с принципами усвоения второго языка (SLA) с целью повышения персонализированного изучения китайского языка для иноязычных учащихся, с акцентом на Кыргызстан в рамках инициативы «Один пояс, один путь». В исследовании применялся смешанный методологический подход, включавший всестороннюю оценку трех платформ (ChatGPT, DeepSeek и Doubao), полуструктурированные интервью с экспертами в области образования, а также теоретический анализ, основанный на признанных теориях, включая гипотезу вводимых данных Крашена и гипотезу взаимодействия Лонга. Оценка платформ показала различия в их возможностях по ключевым параметрам, при этом DeepSeek продемонстрировала наилучшие результаты в области языковой обработки. Интервью с экспертами выявили три основных механизма персонализированного обучения: адаптивное создание контента, индивидуальное отслеживание прогресса и предоставление мгновенной обратной связи. Однако культурная адаптивность стала значительным вызовом, выявив ограничения в учете социокультурных аспектов обучения, требующих участия педагогов. В статье разработана стратегическая четырехфазная модель внедрения, направленная на преодоление ключевых барьеров, включая недостаточность технической инфраструктуры, пробелы в подготовке преподавателей и экономические ограничения. Были предложены стратегии культурного мостостроительства для связывания китайского учебного контента с местными контекстами, что может служить воспроизводимой моделью для различных регионов инициативы «Один пояс, один путь». Исследование показало потенциал AIGC в дополнении, а не замещении человеческого преподавания благодаря интеллектуальному созданию контента и адаптивным траекториям обучения. Несмотря на наличие методологических ограничений, таких как небольшой объем выборки и отсутствие прямых измерений результатов учащихся, полученные выводы заложили основу для устойчивой и культурно-чувствительной интеграции технологий в международное образование по китайскому языку

Ключевые слова: теории изучения языков; технологии AIGC; преподавание китайского языка; реформа образовательных моделей; технологии в педагогике